

Notes on breeding and food of Yellow-billed Kite

Milvus migrans parasitus in Mali

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Notes sur la nidification et la nourriture du Milan noir *Milvus migrans parasitus* au Mali. Durant des missions de courte durée dans le Delta intérieur du Niger, en janvier–février 2004 et 2005, tous les Milans noirs *Milvus migrans* observés de près appartenaient à la sous-espèce afrotropicale *parasitus*. Leur reproduction ne fut observée qu'aux environs proches de villages et des points d'eau permanents, à condition qu'il y eût des arbres disponibles pour leur nidification. La reproduction était asynchrone, montrant plusieurs stades du cycle tels que lieux de nidification non-occupés, rassemblements d'oiseaux non-nicheurs, comportement non-territorial près des nids, comportement pré-nuptial, vols nuptiaux, accouplements, pontes non complètes et complètes, et oisillons âgés d'une à quatre semaines. Typiquement, des couples non-nicheurs et des sites de nidification abandonnés furent notés à plus de 5 km de points d'eau permanents; il se pourrait que ces sites soient occupés dans la saison pluvieuse (pluies principales en juillet–août). La saison de la reproduction dans le Delta intérieur semble coïncider avec la décrue du fleuve (novembre–mars). Lors d'une faible crue (telle que celle de 2004–05: 4,11 m à Akka, superficie inondée du Delta 10 400 km²) une proportion plus grande paraît renoncer à la reproduction que lors d'une crue plus importante (comme en 2003–04: 4,96 m à Akka, 14 700 km² inondés). Les milans nichant dans le Delta intérieur se nourrissaient principalement d'amphibiens et de poissons, complétés par des oiseaux et des petits mammifères. La plupart des proies étaient des charognes et des déchets humains. L'espèce semblait profiter des ressources alimentaires abondamment exploitables dans la forêt inondable de Dentaka où notamment la mortalité des Cormorans africains *Phalacrocorax africanus* fut très élevée dans la saison 2004–05. En janvier 2005 c'était la seule localité où les milans étaient en pleine reproduction.

Summary. During short surveys of the Inner Niger Delta, Mali, in January–February 2004 and 2005, all Black Kites *Milvus migrans* that were closely observed belonged to the subspecies *parasitus* (Yellow-billed Kite). Breeding was largely confined to around villages and permanent water, given suitable trees for nesting. Breeding was asynchronous, varying from still-deserted nest sites to non-breeding flocks, non-territorial behaviour near nests, pre-incubation behaviour, display, copulation, incomplete and completed clutches, and nestlings of seven days to four weeks old. Non-breeding pairs and deserted nest sites were typical of sites >5 km from permanent water. Possibly, such nests are occupied in the rainy season (core period July–August). Pairs in the Inner Delta timed their breeding cycle with the receding flood of the Niger (November–March). During a low flood (as in 2004/2005: maximum at Akka 4.11 m, i.e. 10,400 km² inundated), apparently a larger proportion of pairs refrain from breeding in winter than during a high flood (as in 2003/2004: 4.96 m at Akka, 14,700 km² inundated). Kites breeding in the Inner Niger Delta mainly fed on amphibians and fish, supplemented with birds and mammals. Most food was scavenged, with a high proportion of human waste. Local food bonanzas were readily exploited, as in Dentaka forest, where in 2005 many kites profited from mass mortality of Long-tailed Cormorants *Phalacrocorax africanus* and herons; only at this site was breeding of kites in full swing in January 2005.

In *The Birds of Africa* (Brown *et al.* 1982), Black Kite *Milvus migrans*, including its African subspecies the Yellow-billed Kite *M. m. parasitus*, is stated to be very well known in Africa. Much of

this information, however, is from East and South Africa (Curry-Lindahl 1981, Brown *et al.* 1982). Data from West Africa are rather scarce. For example, Lamarche (1980) considered *parasitus* to be



Figure 1. Distribution and status of nests of Yellow-billed Kites *Milvus migrans parasiticus* checked in the Inner Delta of the Niger River in Mali (160 × 150 km, shaded = water), in January–February 2004 and 2005. Open circle = occupied nest without eggs or nestlings, filled circle = nest with egg(s), triangle = nest with chick(s).

Distribution et statut des nids de Milans noirs *Milvus migrans parasiticus* contrôlés dans le Delta intérieur du Niger au Mali (160 × 150 km, hachuré = point d'eau), en janvier–février 2004 et 2005. Cercle ouvert = nid occupé sans œufs ni oisillons; cercle plein = nid avec œuf(s), triangle = nid avec oisillon(s).

confined to areas around habitation and to nest throughout the year north as far as 17°N in Mali, but details are lacking. Thiollay's (1976, 1978) raptor study in the Lamto region of Côte d'Ivoire (06°13'N 05°02'E) contained specific information on breeding and food of Yellow-billed Kites, but was undertaken in well-forested savanna some 1,000 km south of our study area in Mali.

Whilst conducting ornithological research in the Inner Delta of the Niger River in Mali, in January–February 2004 and 2005, we collected data on the local population of Yellow-billed Kites. Although far from complete, publication is warranted in light of the scarcity of detailed data from West Africa.

Study area

Situated in the Sahel, the Niger Delta is a seasonal, river-fed floodplain of which the flooded surface varies between 10,000 and 30,000 km². The Inner Niger Delta is one of the largest floodplains in Africa, fed by rainfall in montane Guinea.

Although local rainfall is mainly concentrated in July–August, maximum flood is reached in November–December (Zwarts & Diallo 2002). In winter 2003/04, the maximum water depth was 4.96 m, i.e. a normal flood compared to the long-term range of 3.25–6.25 m at Akka, along the Issa-Ber, during the past 45 years, but among the three highest since 1994, when flood performance considerably improved after decades of drought (Zwarts & Diallo 2002). This amounts to a flooded surface of 14,700 km². In winter 2004/05, maximum water depth at Akka reached only 4.11 m (flooded surface 10,400 km²), with a decline in water depth of 5–6 cm day⁻¹ in January 2005. Overall, the Inner Delta was much drier over larger parts during our survey in 2005 than in 2004. Also, many trees had shed their leaves, especially in the dry zones.

The area is flat and largely deforested. Remnant inundated forests of *Acacia kirkii* and *Zizyphus amphibius* occur patchily where water levels do not exceed 2–4 m, notably at Akkagoun

Table 1. Egg size (mm) of Yellow-billed Kites *Milvus migrans parasiticus* nesting in the Inner Niger Delta in Mali; all clutches except no. 408 complete (egg number not necessarily representing laying order).

Tableau 1. Taille des œufs (mm) de Milans noirs *Milvus migrans parasiticus* nichant dans le Delta intérieur du Niger au Mali; toutes les pontes sauf le no. 408 complètes (le numéro de l'œuf ne représente pas nécessairement l'orde de ponte).

Site (nest no.)	Date	Egg 1	Egg 2	Egg 3
Diaka (12)	30 January 2004	51.3 × 41.6	51.5 × 39.9	
Somadougou (24)	13 February 2004	51.4 × 37.2	49.0 × 37.3	48.7 × 36.3
Dentaka (293)	28 January 2005	51.1 × 40.6	51.6 × 38.8	52.2 × 41.2
Dentaka (298)	28 January 2005	55.0 × 42.4	52.9 × 42.0	56.1 × 42.4
Dentaka (300)	28 January 2005	46.9 × 39.2	48.3 × 40.4	46.1 × 39.0
Mopti (408)	1 February 2005	51.0 × 39.8		

and Dentaka. On the high banks of the rivers Niger, Mayo Dembé and Diaka, a scattered growth of several *Acacia* species (*Acacia sayal*, *A. nilotica* and *A. albida*) and *Balanites aegyptiaca* occurs. Near villages, recently planted woodlots of the evergreens *Eucalyptus camaldulensis* and *Azadirachta indica*, and small stands of palms, *Ficus* spp., (mainly *platyphylla*) and *Acacia* provide nesting sites for raptors. Sparse tree cover is also available on farmland adjacent to the floodplain of the Inner Delta.

Methods

On 19 January–15 February 2004 and 19 January–4 February 2005, we surveyed a large part of the Inner Delta between Mopti (14°30'N 04°12'E), Korientzé (15°18'N 03°48'E), Akka (15°40'N 04°23'E) and Ténenkou (14°27'N 04°55'E) by pirogue and on foot. Our main objective was to assess the use of various vegetation types (mainly Bourgou *Echinochloa stagnina*, Didéré *Vossia cuspidata*, wild rice *Oryza longistaminata* and water lilies *Nymphaea* spp.) by birds, in relation to seasonal and annual changes in water level. We systematically censused all birds present

in 258 and 177 plots of <1–100 ha respectively in 2004 and 2005, scattered over the Inner Delta and stratified according to vegetation type and water depth. Although somewhat biased towards areas reachable by pirogue and by car, our surveys otherwise covered a random sample of the region, varying from extremely dry to extremely wet in all available habitats.

Whilst travelling by boat between census areas, and during and in between censuses, we recorded all raptors and endeavoured to check Yellow-billed Kite nests whenever possible. In 2004, 23 of 24 nests were accessed, the remaining nest being observed from the ground. In 2005, we recorded 62 nests, of which 14 were climbed, 12 closely scrutinised from the ground and 30 observed for occupation from a distance (breeding or attending bird visible, transportation of prey or nesting material, dilapidated or not). Behaviour and moult of pair members was recorded during nest visits, as well as nest tree species, nest height, clutch size, egg size (to the nearest tenth of a mm with callipers), body mass, maximum wing-chord and crop size of nestlings, and food remains. Nestling age was estimated by comparing weights

Table 2. Weights (g), measurements (mm) and crop (0=empty, 2=bulging) of nestling Yellow-billed Kites *Milvus migrans parasiticus*, 30 km south of Sévaré in 2004 and at Dentaka, in Lac Walado Debo, in 2005.

Tableau 2. Poids (g), mensurations (mm) et jabot (0=vide, 2=bombé) d'oisillons du Milan noir *Milvus migrans parasiticus*, 30 km au sud de Sévaré en 2004 et à Dentaka, au Lac Walado Débo, en 2005.

Site (nest no.)	Date	Chick	Wing length	Body mass	Crop
Somadougou (15)	12 February 2004	A	38	143	0
Somadougou (15)	12 February 2004	B (dead)	21	35	0
Somadougou (21)	13 February 2004	A	135	495	0
Dentaka (299)	28 January 2005	A	73	335	2
Dentaka (299)	28 January 2005	B	59	275	2
Dentaka (299)	28 January 2005	C	37	135	2

and measurements with growth curves of *M. m. migrans* obtained from wild broods (Bos 1999) and chicks in captivity (Jones 1990, Bijlsma 1997).

Some nests had been used the previous year, and food remains on and below such nests were also collected (for identification of amphibians cf. Rödel 2000). This was far more successful in 2004, as cattle and sheep had not yet trampled the ground (as in 2005).

Distribution

Yellow-billed Kite is a common raptor in the Inner Delta of the Niger River, but completely flooded areas without trees are mostly avoided. Territorial pairs occurred wherever trees were available for nesting, with a preference for those around habitation and close to (permanent) water (Fig. 1). Despite systematic searches in and close to the Inner Delta, we were unable to locate kite nests away from permanent water, e.g. in a strip of 1–5 km north-east of Akka, 1–5 km east of Sévaré and away from villages in farmland between Sévaré and Somadougou (only one nest in a transect of 25 km with a 200 m-wide belt). A similar scarcity was noticed on 18 January 2004 (07.55–15.50 hrs) between Bamako and Sévaré (10 km east of Mopti), a stretch of c.600 km. Small groups of 2–10 Yellow-billed Kites were only recorded in the villages of Maracacoungo, Sofara, Bounguel and Somadougou, as well as in the cities of Bamako and Ségou. These assemblages were associated with water or marketplaces in villages or towns.

Breeding

In 2004, five out of 24 nest-holding pairs attended a nest site without showing any breeding behaviour. Such birds—either singly or as a pair—circled the nesting tree for a short period of time during our visit. None of these birds was moulting, nor did they call or (mock-) attack. In another 11 nests egg-laying had not yet started but pairs demonstrated pre-incubation behaviour such as nest building, copulation (twice), alarm-calling when we approached the nest, circling overhead and intently watching from nearby during the nest check. Ten of these nests already had some down feathers on the nest rim or in the nest cup.

Two nests contained a single fresh egg, in both cases an incomplete clutch based on the lack of dirt on the egg, the rough egg surface (incubated

eggs become smooth after some time) and they being lukewarm to touch (egg temperature of an incubated clutch is much higher). Another nest probably held at least one egg (the departing bird clearly had a brood patch), but we could not reach the nest in a dense *Acacia* to ascertain its status. Two nests contained apparently complete clutches of respectively two and three eggs (Table 1). In both cases the eggs were smooth and the incubating bird was moulting, indicating that incubation had been underway for some time.

Nestlings were recorded in three nests: a nest with at least one chick of c.4 weeks old in a palm tree near Kanalle (29 January 2004, nest tree not climbed), a nest with a seven-day old chick and a fresh dead, emaciated chick on 12 February 2004, and another nest near Somadougou with a single chick estimated at 16 days old. Chicks in nests 15 and 21 (Table 2) were attended by an adult, of which the first one struck the climber three times on the head.

In 2005, the situation was quite different: of 62 nests closely observed, 30 were loosely attended by 1–2 kites. These birds readily joined other kites or were absent from the nest site for long periods. Sixteen pairs showed some pre-laying behaviour, such as copulation (timed once, without cloacal contact: 8 seconds), transportation of nesting material or prey, chasing away White-billed Buffalo Weavers *Bubalornis albirostris* from the nest rim, display calls and pair-wise nest attendance. Another 16 pairs had active nests with either eggs or nestlings, of which seven were climbed: one incomplete clutch of one egg, five completed clutches of three eggs (Table 1) and one nest with three well-fed chicks of 11, 9 and 7 days old (Table 2). Only at Dentaka forest, in Lake Walado Debo, was breeding in full swing, with eight active nests and another 7–10 expected (half the forest checked, low-flying adults counted). Elsewhere in the Inner Delta, most kites refrained from breeding except some pairs along the Niger River. For example, Yellow-billed Kites at the seasonal lake near Somadougou were not (yet?) breeding, whereas this site held many active pairs in 2004. Interestingly, large flocks of non-breeders were a typical feature of 2005, with 35 at N'Djara-Dire encampment (25 January), 85 at Dentaka (28 January), 450 and 75 on roosts along the Niger (31 January, just north of Bouna) and 25, 50 and 85 near Somadougou (2 February). No

Table 3. Prey remains found on and underneath 11 nests of Yellow-billed Kites *Milvus migrans parasiticus* in the Inner Niger Delta of Mali in January–February 2004, and ditto 14 nests in January–February 2005.

Tableau 3. Restes de proies trouvées sur et en dessous de 25 nids de Milans noirs *Milvus migrans parasiticus* dans le Delta intérieur du Niger au Mali (11 nids en janvier–février 2004 et 14 nids en janvier–février 2005).

Prey species	2004	2005
African Hedgehog <i>Atelerix albiventris</i>	3	2
Musk Shrew <i>Crocidura</i> spp.	0	1
Norwegian Rat <i>Rattus norvegicus</i>	7	12
African Striped Weasel <i>Poecilogale albinucha</i>	3	0
Long-tailed Cormorant <i>Phalacrocorax africanus</i>	2	4
Black-crowned Night Heron <i>Nycticorax nycticorax</i>	2	0
Cattle Egret <i>Bubulcus ibis</i>	1	1
Little Egret <i>Egretta garzetta</i>	0	5
Intermediate Egret <i>E. intermedia</i>	0	1
Squacco Heron <i>Ardeola ralloides</i>	1	0
Domestic Chicken <i>Gallus gallus</i>	4	2
Galliformes spp.	1	0
Spur-winged Lapwing <i>Vanellus spinosus</i>	1	0
Wood Sandpiper <i>Tringa glareola</i>	1	1
Vinaceous Pigeon <i>Streptopelia vinacea</i>	0	1
Senegal Coucal <i>Centropus senegalensis</i>	1	0
Passerine spp.	1	0
Rainbow Lizard <i>Agama</i> spp.	0	1
Common African Toad <i>Bufo regularis</i>	1	0
Crowned Bullfrog <i>Hoplobatrachus occipitalis</i>	32	4
Puddle Frog sp. <i>Phrynobatrachus</i> sp.	2	2
Mudfish <i>Clarias anguillaris</i>	17	1
African Lungfish <i>Protopterus annectens</i>	1	0
Wahrindi <i>Synodontis schall</i>	5	2
Nile Perch <i>Lates nilotica</i>	1	0
African Carp <i>Labeo senegalensis</i>	1	1
Cichlidae spp. <i>Tilapia</i> spp. (mostly <i>zillii</i>)	15	7
Desert Locust <i>Schistocerca gregaria</i>	0	1

such flocks were observed in early 2004, except in the Mopti region.

Most nests were in *Acacia*, the rest in *Balanites aegyptiaca*, palms, *Ficus* spp., *Adansonia* spp., *Eucalyptus* spp. and *Khaya senegalensis*. Nest height averaged 9.3 m (range 3.2–17 m, SD=3.8, N=61), and was highest in *Ficus*, palms and *Eucalyptus*. Nests in *Acacia* were more or less protected from human disturbance by the dense canopy and abundant thorns. However, in 2005 branch-clipping *Acacia* was common practice to provide goats and sheep with fodder. All nest cups were lined with an assortment of rope, rags, plastic, bones, dried goat hide, wasp comb, plant material and dung (Fig. 1).

Food

In 2004, prey remains were mainly collected from nests that had been successful in 2003 (Table 3). Consequently, only indigestible parts and discarded prey items were likely to be found, and the list is evidently not wholly representative of the kite's diet. Prey items collected in 2005 were mostly fresh, hence probably showing a less-biased diet.

The prey list of kites nesting in the Inner Delta of Mali is numerically dominated by frogs and fishes, with a wide range of mammals and birds. Most frogs were intact or partially eaten, and found as dried carcasses on the nest. A Crowned Bullfrog *Hoplobatrachus occipitalis*, transported by an adult kite to a plucking post near the nest with one chick, on 12 February 2004, weighed 155 g and must have been scavenged when already dead (skin dry and cracked, but otherwise quite fresh).

All African Hedgehogs *Atelerix albiventris* were clean-picked, with only the skin (turned inside out) remaining. Adult and juvenile Norwegian Rat *Rattus norvegicus* abdomens, including the tail or skulls, were found on nests, and several were seen being captured alive or transported in 2005 (Dentaka, Niger River, Mopti). African Striped Weasels *Poecilogale albinucha* were only represented by skulls.

Wings or carcasses of Long-tailed Cormorants *Phalacrocorax africanus* and herons were present; one cormorant was enmeshed in a fisherman's net. In 2005, the Dentaka kites clearly profited from the huge colonies of cormorants and herons in the forest; the ground, trees and nests were littered with many thousands of dead or dying cormorants, and smaller numbers of herons and African Darters *Anhinga rufa*. According to local fishermen, the mortality among cormorants was much more pronounced than in previous years. A random sample of 15 plots produced a mean 20 dead Long-tailed Cormorants per 100 m², varying from 3–43 birds per plot⁻¹. Norwegian Rats must have abounded as well; the nest with kite chicks held remains of eight Norwegian Rats. Fishes were represented by skulls (Mudfish *Clarias anguillaris*, Wahrindi *Synodontis schall*, African Carp *Labeo senegalensis*, Nile Perch *Lates nilotica*) or were found intact or partially eaten and dried-out (*Tilapia* spp., African Lungfish *Protopterus annectens*).

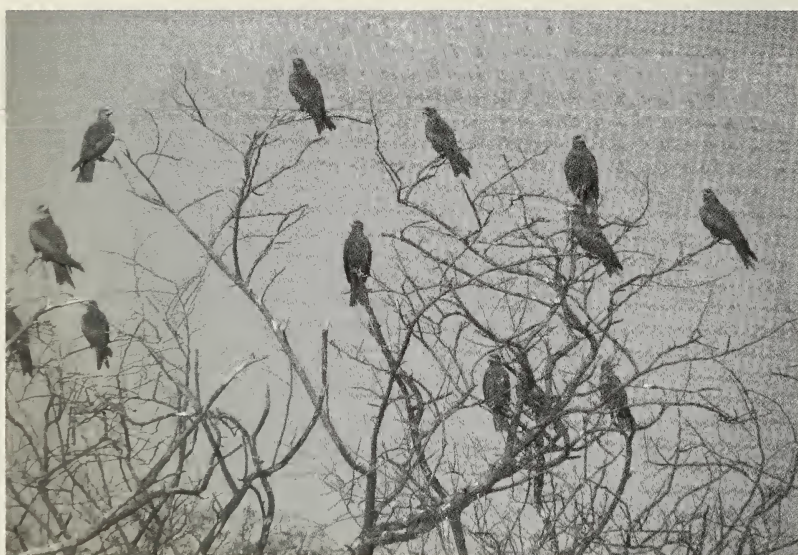
The outbreak of Desert Locusts *Schistocerca gregaria* in West Africa, the largest since 1986–89,



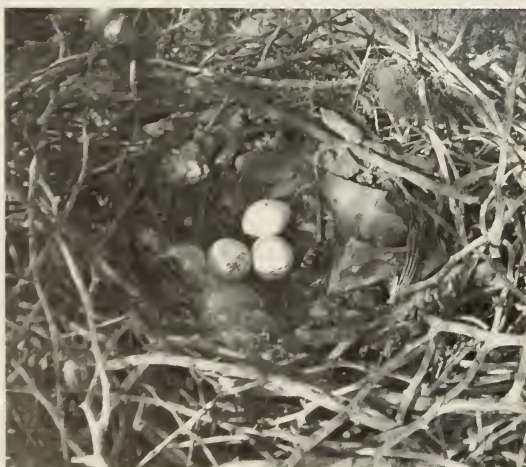
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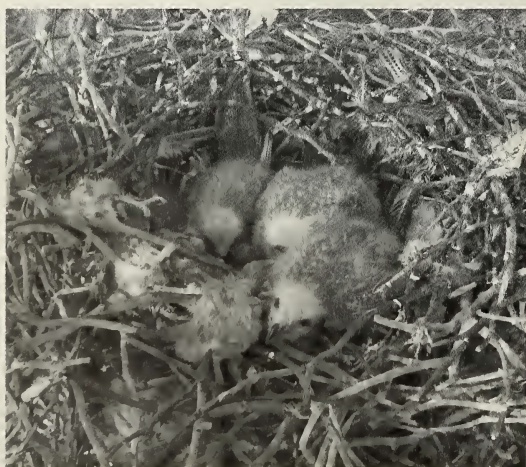
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also reached Mali. In early 2005, we recorded many adult locusts throughout the Inner Delta but nowhere did numbers reach swarm densities. Yellow-billed Kites were seen devouring locusts, but compared with other prey species this was not a significant prey during our short observation periods (Table 3).

Discussion

According to Lamarche (1980), several thousand *M. m. migrans* pass the Sahel zone in Mali in August–September, and again in February–

March. In the Inner Delta, we observed 161 Black Kites closely in order to establish their subspecific identity: all were *M. m. parasitus*. Similarly, the large population (*c.*250 birds) along the Niger River at Mopti consisted entirely of *parasitus*. Again, in early 2005 we failed to record nominate *migrans*, even amongst the larger assemblages (roosts, non-breeding flocks).

Yellow-billed Kites showed a preference for permanent human settlements. All concentrations were near villages, which in turn are largely confined to banks of main watercourses (Niger, Diaka), seasonal lakes (e.g. Wendoubana near Mopti) and permanent lakes (Walado Debo, Debo, Korientzé), accounting for the patchy breeding distribution of Yellow-billed Kites in the delta (Fig. 1). This association is linked to the presence of suitable trees for nesting, permanent water within 1 km and a predictable food supply. Tall trees in villages, or within a radius of 1 km of a village, often contained a stick nest constructed by kites. For example, the well-wooded village of Youvarou, with *c.*6,000 inhabitants, along the Issa-Ber, in the northern Inner Delta, held at least eight territorial pairs, on 26 January 2004, which foraged within the confines of the village including the shoreline. Where villages were >1 km away from permanent surface water, even if trees were available, nesting Yellow-billed Kites were often absent. Temporary encampments, established in the wake of the receding flood during the winter, to be dismantled as soon as fishing opportunities deteriorate, attracted Yellow-billed Kites for the duration of fishing activities because of the presence of extensive beds with fish drying in the sun. A census of Yellow-billed Kites exploiting such sites on 17–25 January 2004 showed a significant positive correlation between the number of such temporary settlements and the number of kites (Spearman, $r_s = 0.6934$, $df = 11$, one-tailed, $P = 0.004$).

The association with people and water is also clearly borne out by the choice of food. Our dietary sample in the Inner Delta, however, is unlikely to be typical of other regions and other seasons. In our list, for example, pericarp of the African Oil Palm *Elaeis guineensis* (not occurring in Inner Delta of Mali, where instead *Borassus Palm* *Borassus aethiopum*, Doum *Hyphaene thebaica* and—locally—Date Palm *Phoenix dactylifera* can be found), Red-billed Queleas *Quelea quelea*,

Captions to figures on opposite page

Figure 2. Nest of Yellow-billed Kite *Milvus migrans parasiticus* with freshly laid egg in palm tree, surrounded by offal and human faeces, Debo Lake, Mali, 23 January 2004 (Willem van Manen)

Nid d'un Milan noir *Milvus migrans parasiticus* dans un palmier, contenant un œuf fraîchement pondu et entouré d'ordures et d'excréments humains, Lac Débo, Mali, 23 janvier 2004 (Willem van Manen)

Figure 3. Adult Yellow-billed Kite *Milvus migrans parasiticus* feeding chick(s), Niger River near Mopti, Mali, 19 January 2005 (Willem van Manen)

Milan noir *Milvus migrans parasiticus* adulte nourrissant un/des oisillon(s), fleuve Niger près de Mopti, Mali, 19 janvier 2005 (Willem van Manen)

Figure 4. Flock of non-breeding Yellow-billed Kites *Milvus migrans parasiticus* within 100 m of the nearest active kite nests, Dentaka forest, Mali, 28 January 2005 (Willem van Manen)

Groupe de Milans noirs *Milvus migrans parasiticus* non-nicheurs se trouvant à moins de 100 m des nids occupés les plus proches, forêt de Dentaka, Mali, 28 janvier 2005 (Willem van Manen)

Figure 5. Completed clutch of Yellow-billed Kite *Milvus migrans parasiticus*, surrounded by clumps of clay and wing of a Long-tailed Cormorant *Phalacrocorax africanus*, Dentaka forest, Mali, 28 January 2005 (Willem van Manen)

Ponte complète d'un Milan noir *Milvus migrans parasiticus* entourée de morceaux d'argile et d'une aile de Cormoran africain *Phalacrocorax africanus*, forêt de Dentaka, Mali, 28 janvier 2005 (Willem van Manen)

Figure 6. Nestling Yellow-billed Kites *Milvus migrans parasiticus*, aged 7–11 days, surrounded by prey remains at Dentaka forest, Mali, 28 January 2005 (Willem van Manen)

Oisillon de Milan noir *Milvus migrans parasiticus* âgé de 7–11 jours, entouré de restes de proies, forêt de Dentaka, Mali, 28 janvier 2005 (Willem van Manen)

insects and caterpillars are lacking; these items were abundantly taken by Yellow-billed Kites nesting in Côte d'Ivoire, as construed from visits to active nests and stomach analyses of collected birds (Thiollay 1978), and elsewhere in West Africa (Brown 1971, Brown *et al.* 1982).

Apart from frogs and mammals, almost all prey remains found at nests were apparently scavenged near villages, along the shoreline, from the water surface and in waterbird colonies. During the flood, fishing in the delta is very intense, involving tens of thousands of people and many tons of fish each season. Most fish are consumed locally, whilst dried and smoked fish is mostly exported within Mali or to neighbouring countries. Drying fish is an important food source for kites, and roving kites are a common sight in villages in the Inner Delta. A side effect of fishing with standing nets is the capture of large numbers of waterbirds, especially cormorants and egrets/herons. Drowned birds—except those with webbed feet—are discarded by the local people, unless caught alive and killed in the proper way according to Islamic law. Furthermore, large numbers of herons, egrets, ducks and terns are caught annually on baited fishing lines (Kone *et al.* 2002). When caught alive, they are consumed locally or sold at nearby markets; if already dead, they are thrown away. This is a profitable food source for kites in November–March. At one deserted campsite, occupied for a few weeks, at most, in late-January 2004, the remains of 42 Long-tailed Cormorants, 30 Cattle Egrets, one Little Egret, two Grey Herons *Ardea cinerea*, one domestic chicken and one Yellow-billed Kite were collected around the cooking spot. Doubtless, most fishes and birds in Table 3 were originally killed by people and eventually scavenged by kites. With the present dataset, we are unable to state whether only breeding kites profit from discards, or non-breeders as well. A study of Black Kites in Spain revealed that garbage dumps were exploited by non-breeding and migrant kites, whereas breeders foraged on a variety of wild prey and rarely scavenged at dumps (Blanco 1997).

Our small sample of nests revealed a wide variation in the timing of breeding during January and February 2004: many nest sites were unoccupied (empty nests with no evidence of the presence of pairs), pairs were not yet territorial (showing up at nest sites after 5–15 minutes, and exhibiting no

territorial or aggressive behaviour), pre-incubation behaviour (copulation, display, calling, permanent presence at nest site), just starting egg-laying (22/23 January, 29/30 January), advanced incubation (30 January, 13 February), and four nests with chicks between seven days old (12 February), 16 days old (13 February) and four weeks old (29 January). The latter pair must have started egg laying in the final week of November. Our expectation that even fewer Yellow-billed Kites would be nesting in the Inner Delta in early 2005, based on the much lower flood compared with the previous year, was proven correct. Only at Dentaka was breeding well advanced, probably because of the profusion of dead cormorants and herons in the local colony, and the supposed abundance of rats and fish scraps.

All pairs with active nests, both in 2004 and 2005, bred within a short distance of permanent water and villages; pairs not yet showing breeding behaviour resided near villages >5 km away from permanent open water. Our limited dataset suggests that Yellow-billed Kites in the Inner Delta of the Niger River, to a large extent, depend on food sources associated with the annual flood in November–March, especially when breeding (and moulting). In March–May, the dry season, the Inner Delta is largely devoid of kites, their whereabouts unknown. Possibly, many kites disperse south after the flood has passed the Inner Delta, anticipating the rainfall from June. First rains may also explain the presence of *c.*500 Yellow-billed Kites (amongst them many juveniles) between Sévaré and San (*c.*200 km along the southern Inner Niger Delta fringe) at 05.00–07.00 hrs, on 6 July 2004, feeding on squashed frogs on the road. Those nesting some distance from permanent water may time the breeding cycle in association with the rainy season (July–August) and subsequent outbreaks of termites (as in Côte d'Ivoire: Thiollay 1976).

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